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Some remarks on size differences of northwest German game populations from Neolithic to modern times

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Starting-point of this consideration is the bone material from medieval Schleswig, excavation Schild (Vogel 1983). For a certain period during the Middle Ages Schleswig, situated in the northern part of Schleswig-Holstein (Fig. 1), was one of the most important trade centres in Europe, i.e., from the 11th century after the decline of nearby Haithabu until the middle of the 13th century when Lübeck, situated 100 km southeastwards and finally the capital of the Hanseatic League, succeeded in its place (Hoffmann 1981).

At the excavation site nearly 112000 bones of mammals were found. Only 1350 of these bones, which is a small fraction of 1.2%, were from wild mammals, the rest from domestic ones (Hüster 1990). This is typical for medieval sites (Reichstein et al. 1980). According to the relative frequencies of the remains the most important game were the artiodactyl species red deer (n = 397), roe deer (n = 323) and wild boar (n = 82), and further the brown hare (n = 312) and red fox (n = 97). Although the amount of bone material of

Fig. 1. Schleswig-Holstein. Location of the medieval trade centres Haithabu, Schleswig, and Lübeck as well as some other medieval settlements

these species is hardly satisfactory, it was the basis for size analyses, and was compared with corresponding bones not only from other early historic and prehistoric sites, but also with recent skeletal material (collection of Institut für Haustierkunde, University of Kiel).

In roe deer and in wild boar no size differences are apparent between the Schleswig material and that of other medieval or neolithic sites. However, compared with recent skeletons from Schleswig-Holstein it is obvious that roe deer and wild boar today are significantly smaller than the individuals of these species identified for medieval Schleswig and for the other sites. In roe deer this is shown by the measurements 'maximum length' of radius and metacarpus and 'distal width' of metacarpus (Fig. 2).

This tendency – evident differences in size between pre- or early historic findings and recent skeletal material – is also true for red deer (Fig. 3). In any case the recent material is relatively small-sized and corresponding differences in body size can be deduced. But the comparison of the Schleswig material with other subfossil bones has shown that red deer of the early medieval strongholds Scharstorf and Bischofswarder, situated in eastern Holstein, partly must have been even larger. This is shown by the measurement 'maximum length' of calcaneus, whereas similar differences cannot be established in phalanx 1, the second skeletal element analysed.

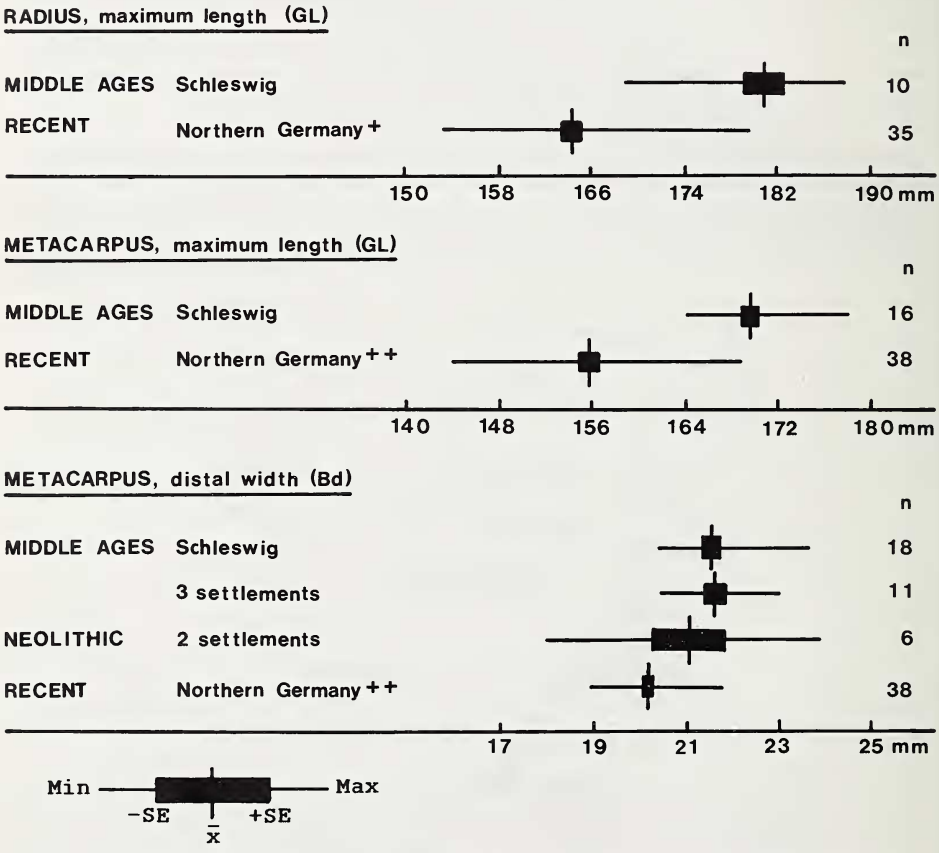

Fig. 2. Roe deer, *Capreolus capreolus*. Comparison of size between finds from Schleswig, various northwest German sites (Middle Ages: Haithabu – Reichstein 1990; Lübeck Königstraße – Paul 1980; Hitzacker – Walcher 1978; Neolithic: Hüde I – Hübner et al. 1988; Rosenhof – Nobis 1975) and recent material; + 24 ♀♀, 11 ♂♂; ++ 25 ♀♀, 13 ♂♂

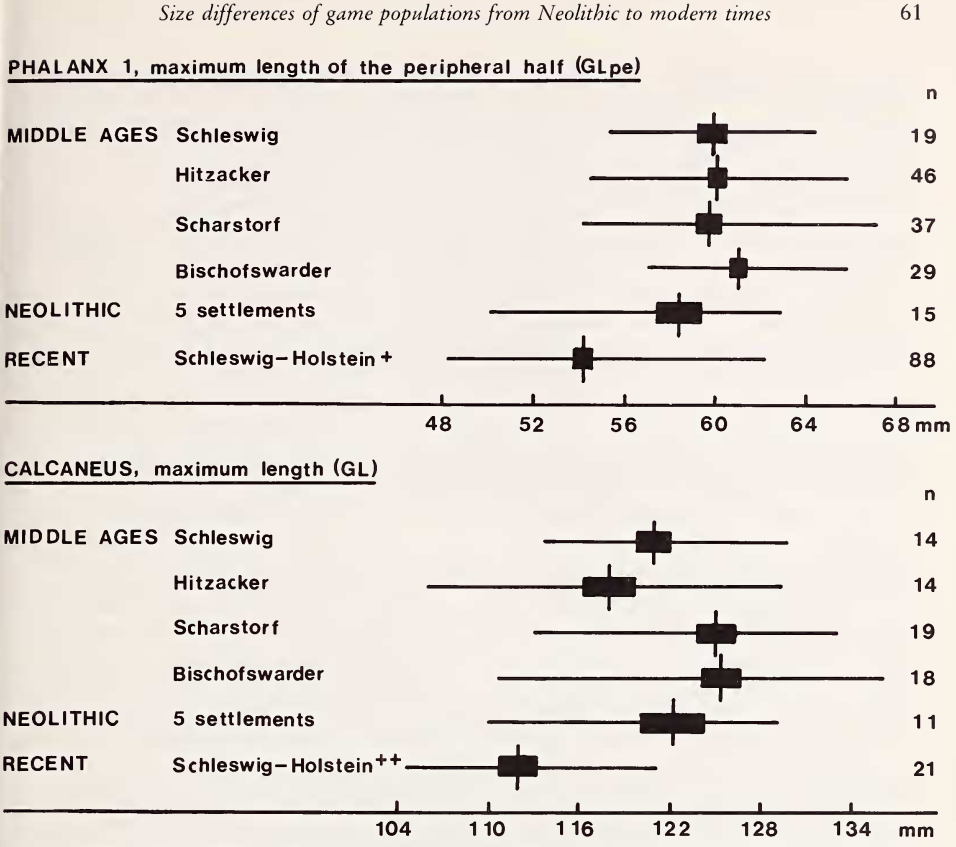

Fig. 3. Red deer, *Cervus elaphus*. Comparison of size between finds from Schleswig, various northwest German sites (Hitzacker – Walcher 1978; Scharstorf – Heinrich 1985; Bischofswarder – Reichstein et al. 1980; Neolithic: Hüde I – Hübner et al. 1988; Bistoft – Johansson 1979; Süssau – Nobis 1971; Rosenhof – Nobis 1975, Stinthorst – Gehl 1976) and recent material; + 7 ♀♀, 4 ♂♂; ++ 6 ♀♀, 4 ♂♂, 1 sex?

Corresponding analyses of brown hare and red fox did not yield such results. In the case of hare only very few measurements showed significant size differences, but always without a clear tendency. In the case of the fox size differences were found only in the mandibula, which is larger in recent specimens compared with those from Schleswig. In the analysis of the large amount of material of red fox from Haithabu Reichstein (1990) obtained similar results.

The clear dissimilarities that could be shown especially in red deer, roe deer and wild boar, concern only size but apparently not shape. Shape differences between single bones would point to dissimilarities of the stature of animals. But when correlating two measurements of phalanx 1 anterior of the red deer by regression methods these bones of all populations converged to one straight line, which describes the allometrical relationship of the two measurements taken (Röhrs 1959). Looking at roe deer, however, no correlations at all could be found. This points to a large variability in this species. Such methods could not be employed in the analysis of wild boar, because the quality of the material was too poor.

This size reduction in the artiodactyl species must be a modern phenomenon for one cannot see similar differences between the samples of the various early historic or prehistoric sites. This means that from neolithic to medieval times there were no changes

which could bring about diminution or enlargement. Thus, it can be noted that the degree of climatic influences in the course of this long period was too low to alter the size of the species in the sense of Bergmann's rule (climate-size-rule). Corresponding results especially for red deer and roe deer have been repeatedly shown, for instance by Boessneck (1956), Requate (1956), Reichstein (1974), and Kratochvíl (1988).

This phenomenon – no alterations in size over a long period followed by a sudden diminution in the recent past – can be explained by human influence on landscape and vegetation. Although man has modified the landscape by agricultural activities since centuries – e.g. especially the medieval clearing of woodland for cultivation – the alterations caused by human activities are becoming more extensive and frequent especially in the last few decades. Here, one must not only see the modern cultivation, but also the development of settlements and the progress of traffic. Further, one must note that modern forestry is not suitable for game. The same is true for modern hunting with its demand for trophies. Whereas these factors are essentially responsible for the diminution in red deer and probably also in wild boar, the relatively small size of roe deer, however, presumably is only indirectly connected with them: According to Klein and Strandgaard (1972) in this species size is correlated with population density to a high degree, which in return is dependent on landscape and vegetation, cover, food value etc. The above-mentioned variability of roe deer in shape must also be seen in this context (Sägesser 1966). All in all the transformation of the natural landscape to a cultural one with all of its implications can be considered the main cause for diminution of these species, which are vegetarian or partly so (*Sus scrofa*) and which are more or less confined to the woods. It cannot be decided, whether this recent size reduction is a result of mutations or – until now – only expression of a modification caused by the bad conditions of life for these species. However, it is obvious that a phylogenetic tendency of diminution like that supposed by von Lehmann (1960) in the case of roe deer after considering a far longer period cannot be the explanation for the present results, as the described size reduction is a modern event.

Hare and fox are not affected in this way. These species require quite different living conditions. Originally the hare is a mammal of the steppe. Thus, the development of the cultural landscape with fields and pastures instead of woodland improved its ecological basis, although some other living conditions were worsened. Therefore it is understandable that one cannot observe a clear trend of diminution. But one should also bear in mind, for instance, that the recent population from Schleswig-Holstein is not a truly autochthonous one: In the beginning of this century hares from many areas, especially from southeast Europe, were released here (Mohr 1931). The fox is a carnivore and for this reason is only indirectly dependent on vegetation or landscape like the other animals. Moreover it has a good ecological adaptability.

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